REMARKS/ARGUMENTS

Claims 1-20 were previously pending in the application. Claims 3, 7, 13, 15, and 17 are amended, and new claims 21-24 are added herein. Assuming the entry of this amendment, claims 1-24 are now pending in the application. Support for new claims 21-24 is found in Fig. 6. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

Objections to Claims

On page 2 of the office action, the Examiner objected to claims 13-20 because "they do not include all necessary steps of the method claims." The Examiner did not provide any further explanation as to what other steps the Examiner believes are "necessary" for the method claims. In response, the Applicant has amended claim 13 to recite that the method comprises "applying power to the filter," in addition to the step of "configuring at least one of the gm cells to have substantially zero transconductance." The Applicant submits that, if these two steps are performed, then the at least one filter section will oscillate. As such, the Applicant submits that currently amended claim 13 does "include all necessary steps of" that method claim.

Rejections of Claims under 35 U.S.C. 112, Second Paragraph

On page 2, the Examiner also rejected claims 1-20 under 35 U.S.C. 112, second paragraph, as being indefinite. The Applicant notes that the Examiner's specific arguments apply directly to only claims 3, 5, 7, 15, and 17. As such, the Applicant submits that the Examiner's rejections of claims 1-2, 8-14, 16, and 18-20 under 35 U.S.C. 112, second paragraph, are improper.

Regarding the rejections of claims 3 and 15, the Applicant has amended claims 3 and 15 to recite that "the at least one of the gm cells is the third gm cell."

Regarding the rejections of claims 7 and 17, the Applicant submits that the amendments to those claims overcome those rejections.

Regarding the rejection of claim 5, the Applicant traverses this rejection. The Examiner stated that the recitation in claim 5 that "the at least one filter section is adapted to be configured to oscillate" is misdescriptive because it is inconsistent with what is recited in claim 1. In particular, the Examiner stated that "claim 1 recites that the gm cell of the at least one or more filter section is configured to oscillate." The Applicant submits that claim 1 does not contain such a recitation. Claim 1 recites that "at least one of the gm cells can be configured to have substantially zero transconductance, such that the at least one filter section will oscillate." This is not inconsistent with claim 5. As such, the Applicant submits that claim 5 is not misdescriptive.

In view of the foregoing, the Applicant submits that the rejections of claims under Section 112, second paragraph, have been overcome.

Prior-Art Rejections

On page 3, the Examiner rejected claims 1-2, 5-14, 16-17, and 20 as being unpatentable over Deveirman. On page 4, the Examiner stated that claims 3-4, 15, and 18-19 would be allowable if rewritten to overcome the rejection(s) under Section 112, second paragraph. For the following reasons, the Applicant submits that all of the now-pending claims are allowable over Deveirman.

Claims 1 and 13

Claim 1 is directed to circuitry comprising a filter having one or more filter sections. At least one of the one or more filter sections comprises a plurality of transconductor (gm) cells. At least one of the gm cells can be configured to have substantially zero transconductance, such that the at least one filter section will oscillate. Deveirman does not teach or even suggest such a combination of features.

Deveirman does teach circuitry comprising a filter having one or more filter sections, where at least one of the one or more filter sections comprises a plurality of gm cells. Moreover, Deveirman does teach that at least one filter section in the filter can be configured such that the filter section will oscillate. Significantly, however, Deveirman does not teach or even suggest that one of the gm cells in the filter section can be configured to have substantially zero transconductance. Rather, Deveirman teaches two different techniques for configuring a filter section to oscillate, both of which involve configuring the filter section with different gm cells that have non-zero transconductances that negate each other.

In particular, in column 6, lines 30-35, Deveirman states:

> Test mode oscillation of monolithic gm-C filters is accomplished by reversing the polarity of one or more of the feedback connections, or by switching in an extra transconductance of appropriate positive or negative value to move poles from the left half of the s-plane onto the imaginary axis or even into the right half-plane in some embodiments.

Thus, Deveirman's first technique is "reversing the polarity of one or more feedback connections," and Deveirman's second technique is "switching in an extra transconductance."

Deveirman's second technique is represented in Fig. 6, where transconductance amplifier 600 is added to the biquad structure shown in Fig. 3. In particular, "transconductance amplifier 600 is coupled similarly to transconductance 306 of FIG. 3 except that the outputs of transconductance amplifier 600 are not cross-coupled. For this reason, the transconductance value (gm, osc) of transconductance amplifier 600 is of opposite polarity to the transconductance (gm2) of transconductance amplifier 306." See column 8, lines 1-7. As described in the subsequent passages in column 8, the filter section of Fig. 6 will oscillate if the non-zero transconductance gm, osc of amplifier 600 is specifically designed to offset the non-zero transconductance gm2 of amplifier 306, such that the net transconductance of the two amplifiers is zero.

Thus, according to Deveirman's second technique, a filter section is configured to oscillate, not by configuring a gm cell to have substantially zero transconductance, but rather to add an extra gm cell with opposite polarity such that the non-zero tranconductances of those two gm cells will offset each other. Although Deveirman's second technique and the present invention both result in oscillation of a filter section, they do so by very different techniques.

Although there are very few details provided, Deveirman's first technique (i.e., reversing the polarity of one or more feedback connections) is also very different from the technique of the present invention. Other than the passage quoted earlier, the only other teaching in Deveirman related to the first technique is found in column 7, lines 52-56, which states:

> The preferred embodiment of the present invention forces gm2 to zero in order to force oscillation. As stated above, this is accomplished by altering the internal feedback of the biquad or coupling in a negative transconductance in order to cancel gm2.

Referring to the biquad structure of Fig. 3, for normal (i.e., non-oscillating) operations:

- o The positive output of amplifier 306 is coupled through buffer 305 to the negative input of amplifier 306; and
- o The negative output of amplifier 306 is coupled through buffer 305 to the positive input of amplifier 306.

Although not described in detail anywhere in the reference, presumably Deveirman's first technique of "reversing the polarity of one or more feedback connections" would involve changing the configuration of Fig. 3 such that:

- o The positive output of amplifier 306 is coupled through buffer 305 to the positive input of amplifier 306; and
- o The negative output of amplifier 306 is coupled through buffer 305 to the negative input of amplifier 306.

Significantly, such reversing of the feedback connections would <u>not</u> force the transconductance gm2 of amplifier 306 to substantially zero. Rather, it would simply change the polarity of that non-zero transconductance. In doing so, if the magnitudes and signs of the transconductances of the other amplifiers in the biquad structure are selected appropriately, the inverted transconductance of amplifier 306 (i.e., -gm2) would negate the output transconductances of other amplifiers such that the biquad structure would oscillate.

As in Deveirman's second technique, this first technique involves configuring different gm cells having <u>non-zero</u> transconductances such that their <u>non-zero</u> transconductances negate each other, <u>not</u> reconfiguring a <u>single</u> gm cell to have substantially <u>zero</u> transconductance.

In view of the only two techniques taught by Deveirman, some of the statements made in Deveirman are technically inaccurate and potentially misleading. For example, in column 7, lines 52-53, Deveirman states that "the present invention forces gm2 to zero in order to force oscillation." Technically, neither of Deveirman's two techniques "forces gm2 to zero." As described above, Deveirman's techniques configure different gm cells having <u>non-zero</u> transconductances such that those <u>non-zero</u> transconductances negate each other. At no point does Deveirman disclose any details about reconfiguring a <u>single</u> gm cell such that it will have substantially <u>zero</u> transconductance. As such, Deveirman's statement that "the present invention forces gm2 to zero" is technically inaccurate and cannot be properly relied upon to reject the invention of claim 1.

At most, Deveirman's statement refers to the term "gm2" in Equations [1], [3], and [4], and <u>not</u> to the transconductance of amplifier 306 per se. For example, when amplifier 600 gets added to the biquad structure of Fig. 3, the term "gm2" in the equations no longer refers to the transconductance of only amplifier 306; it now refers to the combined, net transconductance of amplifiers 306 and 600, both of which have <u>non-zero</u> transconductances.

Accompanying this amendment is a Declaration under 37 CFR 1.132 by inventor James A. Bailey attesting to the fact that neither of Deveirman's disclosed techniques forces the non-zero transconductance (gm2) of amplifier 306 to be zero.

The present invention has advantages over the two techniques taught in Deveirman. With respect to one advantage, in Deveirman, in order to achieve oscillation, two or more different gm cells must have non-zero transconductances that negate each other. Even minor deviations from providing transconductances of exactly equal magnitude (but opposite polarity) would adversely affect the amplitude of the resulting oscillation and inhibit the ability of the filter section to provide effective tuning. In practice, providing such gm cells with exactly equal but opposite transconductances requires very careful design or active tuning or both, either of which can add both complexity and expense to the circuitry.

The present invention, on the other hand, does not require two different gm cells to have equal but opposite transconductances. Instead, the present invention can be achieved using a relatively simple and inexpensive technique (as represented in Fig. 6) that configures a single gm cell to have zero transconductance in order to make the corresponding filter section oscillate.

Another advantage that the present invention have over Deveirman is that the present invention allows accurate tuning of the Q of the biquad poles, while Deveirman does not. By setting gm3 to 0 in the exemplary embodiment of the present invention shown in Fig. 2, the only conductances left in the circuit are the output conductances of the gm cells (including gm3). These have the effect of reducing the Q to less than the design value. In the present invention, the output conductances can then be compensated using a nullator circuit such that the amplitude of oscillation equals a predetermined non-critical value. Under this condition, the negative output conductances of the nullators exactly compensate the positive output conductances of the gm amplifiers and, when returned to normal mode, the filter Q will be at the designed value.

Deveirman's technique does not allow for such Q tuning. Once the filter is returned from test mode to normal operation, Deveirman's gmosc is removed (or gm2 outputs are switched back to their usual connections), and the gm cell output conductances remain as before, thus resulting in lower-than-designed Q.

For all these reasons, the Applicant submits that claim 1 is allowable over Deveirman. For similar reasons, the Applicant submits that claim 13 is allowable over Deveirman. Since the rest of the claims depend variously from claims 1 and 13, it is further submitted that those claims are also allowable over Deveirman. The Applicant submits therefore that the rejections of claims under Sections 102(b) have been overcome.

<u>Claims 21 and 23</u>

According to new claim 21, the at least one gm cell has first and second input nodes, where:

- o The at least one gm cell is adapted to be configured to have <u>non-zero</u> transconductance by selectively applying two different input signals to the first and second input nodes; and
- o The at least one gm cell is adapted to be configured to have substantially <u>zero</u> transconductance by selectively applying a <u>single input signal</u> to the first and second input nodes.

Deveirman does not teach or even suggest such features. As such, the Applicant submits that this provides additional reasons for the allowability of claim 21 (and similarly claim 23 and also claims 22 and 24) over Deveirman.

In view of the above amendments and remarks, the Applicant believes that the now-pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

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